What is claimed is:

1. A method of forming a metal interconnect in an integrated circuit device, the method comprising:

forming a diffusion barrier layer on a base layer;

forming a first metal layer on the diffusion barrier layer, wherein the first metal layer comprises a first metal component and a second metal component forming a crystalline compound with the first metal component, wherein the second metal component has a surface energy lower than a surface energy of the first metal component, and wherein the crystalline compound is rich in the first metal component;

forming a second metal layer on the first metal layer, wherein the second metal layer comprises the first metal component; and

removing excess portions of the second metal layer to define the metal interconnect.

2. The method of claim 1, wherein the diffusion barrier layer is a titanium-containing layer.

3. The method of claim 1, wherein the diffusion barrier layer is titanium nitride.

4. The method of claim 1, wherein the first metal component is selected from the group consisting of copper, silver, gold, palladium, platinum, rhenium, iridium, ruthenium and osmium.

5. The method of claim 1, wherein the second metal component is selected from the group consisting of scandium, yttrium, lanthanum, titanium, zirconium and hafnium.

6. The method of claim 1, wherein the first metal layer further comprises a third metal component forming a second crystalline compound with the first metal component, wherein the third metal component is different from the second metal component, wherein the third metal component has a surface energy lower than a surface energy of the first metal component, and wherein the second crystalline compound is rich in the first metal component.

7. The method of claim 1, wherein a portion of the first metal layer comprises the first metal component in its elemental state.

8. The method of claim 1, wherein forming a second metal layer on the first metal layer further comprises forming a second metal layer on the first metal layer using a process selected from the group consisting of chemical vapor deposition techniques, physical vapor deposition techniques, electroplating techniques and electroless plating techniques.

9. The method of claim 1, wherein forming a second metal layer on the first metal layer further comprises forming a seed layer on the first metal layer and electroplating a metal layer on the seed layer, wherein the seed layer and the metal layer form the second metal layer and wherein the seed layer and the metal layer each contain the first metal component.

10. The method of claim 9, wherein the seed layer consists essentially of the first metal component.

11. A method of forming a metal interconnect in an integrated circuit device, the method comprising:
forming a dielectric layer on a base layer;
forming a recess in the dielectric layer;

forming a diffusion barrier layer on sidewalls of the recess and a surface of the base layer;

forming a first metal layer on the diffusion barrier layer, wherein the first metal layer comprises a first metal component and a second metal component forming a crystalline compound with the first metal component, wherein the second metal component has a surface energy lower than a surface energy of the first metal component, and wherein the crystalline compound is rich in the first metal component;

forming a second metal layer on the first metal layer, wherein the second metal layer comprises the first metal component and wherein the second metal layer fills the recess and overlies the surface of the dielectric layer; and

removing portions of the diffusion barrier layer, the first metal layer and the second metal layer overlying the surface of the dielectric layer to define the metal interconnect as portions of the diffusion barrier layer, the first metal layer and the second metal layer remaining in the recess.

12. A method of forming a portion of an integrated circuit device, the method comprising:

forming a layer of titanium nitride;

forming a first metal layer on the layer of titanium nitride, wherein the first metal layer comprises a crystalline alloy compound containing a first metal component and a second metal component, wherein the second metal component is selected from the group consisting of Group IIIA and Group IVA elements, and wherein an atomic ratio of the first metal component to the second metal component in the first metal layer is greater than one; and

forming a second metal layer on the first metal layer, wherein the second metal layer comprises the first metal component.

13. The method of claim 12, wherein the atomic ratio of the first metal component to the second metal component in the first metal layer is greater than two.

14. The method of claim 12, wherein the atomic ratio of the first metal component to the second metal component in the first metal layer is greater than ten.

15. The method of claim 12, wherein the atomic ratio of the first metal component to the second metal component in the first metal layer is greater than twenty.

16. The method of claim 12, wherein the first metal layer further comprises a portion of the first metal component in an elemental state.

17. A method of forming a metal interconnect in an integrated circuit device, the method comprising:
forming a dielectric layer on a base layer;
forming a recess in the dielectric layer;
forming a titanium nitride layer on sidewalls of the recess and a surface of the base layer;
forming a first metal layer on the titanium nitride layer, wherein the first metal layer comprises copper and a metal component forming a crystalline compound with the copper, wherein the metal component is selected from the group consisting of scandium, yttrium, lanthanum, titanium, zirconium and hafnium, and wherein the crystalline compound has an atomic ratio of copper to the metal component in the first metal layer of greater than one;
forming a copper layer on the first metal layer, wherein the copper layer fills the recess and overlies a surface of the dielectric layer; and
removing portions of the titanium nitride layer, the first metal layer and the copper layer overlying the surface of the dielectric layer to define the metal

interconnect as portions of the titanium nitride layer, the first metal layer and the copper layer remaining in the recess.

18. The method of claim 17, wherein the portion of the titanium nitride layer overlying the dielectric layer is adjoining the surface of the dielectric layer and is interposed between the first metal layer and the dielectric layer.

19. A method of forming a portion of an integrated circuit device, the method comprising:
forming a layer of titanium nitride;
forming a metal layer on the layer of titanium nitride, wherein the metal layer comprises a copper-rich alloy selected from the group consisting of Cu_4Sc, Cu_6Y, Cu_4Ti, Cu_3Ti and Cu_5Zr; and
forming a copper layer on the metal layer.

20. The method of claim 19, wherein the copper-rich alloy has a crystalline structure.

21. The method of claim 19, wherein the metal layer further comprises elemental copper.

22. The method of claim 21, wherein at least 25 wt% of the metal layer is the elemental copper.

23. The method of claim 21, wherein at least 50 wt% of the metal layer is the elemental copper.

24. A method of forming a portion of an integrated circuit device, the method comprising:
forming a layer of titanium nitride;

forming a metal layer on the layer of titanium nitride, wherein the metal layer comprises elemental copper, wherein the metal layer further comprises a copper-rich crystalline alloy compound containing copper and a metal component selected from the group consisting of scandium, yttrium, lanthanum, titanium, zirconium and hafnium, and wherein at least 25 wt% of the metal layer is elemental copper; and

forming a copper layer on the metal layer.

25. A method of forming a portion of an integrated circuit device, the method comprising:

forming a layer of titanium nitride;

forming a metal layer on the layer of titanium nitride, wherein the metal layer comprises elemental copper, wherein the metal layer further comprises a copper-rich crystalline alloy compound containing copper and a metal component selected from the group consisting of scandium, yttrium, lanthanum, titanium, zirconium and hafnium, and wherein an atomic ratio of copper to the metal component in the metal layer is greater than ten; and

forming a copper layer on the metal layer.

26. A method of forming a metal interconnect in an integrated circuit device, the method comprising:

forming a dielectric layer on a base layer;

forming a recess in the dielectric layer;

forming a titanium nitride layer on sidewalls of the recess and a surface of the base layer;

forming a first metal layer on the titanium nitride layer, wherein the first metal layer comprises silver and a metal component forming a crystalline compound with the silver, wherein the metal component is selected from the group consisting of scandium, yttrium and lanthanum, and wherein the

crystalline compound has an atomic ratio of silver to the metal component in the first metal layer of greater than one;

forming a silver layer on the first metal layer, wherein the silver layer fills the recess and overlies a surface of the dielectric layer; and

removing portions of the titanium nitride layer, the first metal layer and the silver layer overlying the surface of the dielectric layer to define the metal interconnect as portions of the titanium nitride layer, the first metal layer and the silver layer remaining in the recess.

27. The method of claim 26, wherein the crystalline compound has an atomic ratio of silver to the metal component in the first metal layer of greater than two.

28. A method of forming a portion of an integrated circuit device, the method comprising:

forming a layer of titanium nitride;

forming a metal layer on the layer of titanium nitride, wherein the metal layer comprises a silver-rich alloy selected from the group consisting of Ag_4Sc and Ag_4Y; and

forming a silver layer on the metal layer.

29. The method of claim 28, wherein forming a layer of titanium nitride further comprises forming a layer of titanium nitride covering sidewalls and a bottom of a recess.

30. The method of claim 29, wherein a portion of the layer of titanium nitride covering the bottom of the recess is in contact with a semiconductor substrate.

31. The method of claim 29, wherein a portion of the layer of titanium nitride covering the bottom of the recess is in contact with a conductor layer.

32. The method of claim 31, wherein the conductor layer is a metal layer.

33. A method of forming a portion of an integrated circuit device, the method comprising:

forming a layer of titanium nitride;

forming a metal layer on the layer of titanium nitride, wherein the metal layer comprises elemental silver, wherein the metal layer further comprises a silver-rich crystalline alloy compound containing silver and a metal component selected from the group consisting of scandium, yttrium and lanthanum, and wherein at least 25 wt% of the metal layer is elemental silver; and

forming a silver layer on the metal layer.

34. The method of claim 33, wherein at least 50 wt% of the metal layer is elemental silver.

35. A method of forming a portion of an integrated circuit device, the method comprising:

forming a layer of titanium nitride;

forming a metal layer on the layer of titanium nitride, wherein the metal layer comprises elemental silver, wherein the metal layer further comprises a silver-rich crystalline alloy compound containing silver and a metal component selected from the group consisting of scandium, yttrium and lanthanum, and wherein an atomic ratio of silver to the metal component in the metal layer is greater than ten; and

forming a silver layer on the metal layer.

36. The method of claim 35, wherein the atomic ratio of silver to the metal component in the metal layer is greater than twenty.

37. A method of forming a metal interconnect in an integrated circuit device, the method comprising:

forming a diffusion barrier layer on a base layer;

forming a nitrided metal layer on the diffusion barrier layer, wherein the nitrided metal layer comprises a first metal component, a second metal component capable of forming a crystalline compound with the first metal component, and nitrogen, wherein the second metal component has a surface energy lower than a surface energy of the first metal component, and wherein the nitrided metal layer is rich in the first metal component;

forming a second metal layer on the nitrided metal layer, wherein the second metal layer comprises the first metal component; and

removing excess portions of the second metal layer to define the metal interconnect.

38. The method of claim 37, wherein forming a nitrided metal layer further comprises performing a physical vapor deposition process in a nitrogen-containing atmosphere using a physical vapor deposition source containing the first and second metal components.

39. The method of claim 38, wherein the physical vapor deposition source is a composite source having a first portion containing the first metal component in an elemental state and a second portion containing the crystalline compound of the first and second metal components.

40. The method of claim 39, wherein the first and second portions of the physical vapor deposition source are intermixed.

41. The method of claim 37, wherein forming a nitrided metal layer further comprises sputtering a composite target in a nitrogen-containing atmosphere, wherein the

composite target has a first portion containing the first metal component in an elemental state and a second portion containing the crystalline compound of the first and second metal components, and wherein the nitrogen-containing atmosphere comprises approximately 5% to 30% by volume of nitrogen in an inert gas.

42. The method of claim 41, wherein the first and second portions of the composite target are intermixed.

43. The method of claim 41, wherein the inert gas is argon.

44. The method of claim 37, wherein the diffusion barrier layer is a titanium-containing layer.

45. The method of claim 37, wherein the diffusion barrier layer is titanium nitride.

46. The method of claim 37, wherein the first metal component is selected from the group consisting of copper, silver, gold, palladium, platinum, rhenium, iridium, ruthenium and osmium.

47. The method of claim 37, wherein the second metal component is selected from the group consisting of scandium, yttrium, lanthanum, titanium, zirconium and hafnium.

48. The method of claim 37, wherein forming a second metal layer on the nitrided metal layer further comprises forming a seed layer on the nitrided metal layer and forming a metal layer on the seed layer, and wherein the seed layer and the metal layer each contain the first metal component.

49. The method of claim 48, wherein the seed layer consists essentially of the first metal component.

50. The method of claim 37, wherein the base layer is selected from the group consisting of a semiconductor substrate and a conductor layer.

51. A method of forming a metal interconnect in an integrated circuit device, the method comprising:

forming a dielectric layer on a base layer;

forming a recess in the dielectric layer;

forming a diffusion barrier layer on sidewalls of the recess and a surface of the base layer;

forming a nitrided metal layer on the diffusion barrier layer, wherein the nitrided metal layer comprises a first metal component, a second metal component capable of forming a crystalline compound with the first metal component, and nitrogen, wherein the second metal component has a surface energy lower than a surface energy of the first metal component, and wherein the nitrided metal layer is rich in the first metal component;

forming a metal layer on the nitrided metal layer, wherein the metal layer comprises the first metal component and wherein the metal layer fills the recess and overlies a surface of the dielectric layer; and

removing portions of the diffusion barrier layer, the nitrided metal layer and the metal layer overlying the surface of the dielectric layer to define the metal interconnect as portions of the diffusion barrier layer, the nitrided metal layer and the metal layer remaining in the recess.

52. A method of forming a portion of an integrated circuit device, the method comprising:

forming a layer of titanium nitride;

forming a nitrided metal layer on the layer of titanium nitride, wherein the nitrided metal layer comprises a nitride metal alloy compound containing a first metal component, a second metal component and nitrogen, wherein the second metal component is selected from the group consisting of Group IIIA and Group IVA elements, and wherein an atomic ratio of the first metal component to the second metal component in the nitrided metal layer is greater than one; and

forming a metal layer on the nitrided metal layer, wherein the metal layer comprises the first metal component.

53. The method of claim 52, wherein the atomic ratio of the first metal component to the second metal component in the first metal layer is greater than two.

54. The method of claim 52, wherein the atomic ratio of the first metal component to the second metal component in the first metal layer is greater than ten.

55. The method of claim 52, wherein the atomic ratio of the first metal component to the second metal component in the first metal layer is greater than twenty.

56. A method of forming a metal interconnect in an integrated circuit device, the method comprising:

forming a dielectric layer on a base layer;

forming a recess in the dielectric layer;

forming a titanium nitride layer on sidewalls of the recess and a surface of the base layer;

forming a nitrided metal layer on the titanium nitride layer, wherein the nitrided metal layer comprises copper, a metal component capable of forming a crystalline compound with the copper, and nitrogen, wherein the metal component is selected from the group consisting of scandium, yttrium,

lanthanum, titanium, zirconium and hafnium, and wherein an atomic ratio of copper to the metal component in the nitrided metal layer is greater than one;

forming a copper layer on the nitrided metal layer, wherein the copper layer fills the recess and overlies a surface of the dielectric layer; and

removing portions of the titanium nitride layer, the nitrided metal layer and the copper layer overlying the surface of the dielectric layer to define the metal interconnect as portions of the titanium nitride layer, the nitrided metal layer and the copper layer remaining in the recess.

57. A method of forming a portion of an integrated circuit device, the method comprising:

forming a layer of titanium nitride;

forming a nitrided metal layer on the layer of titanium nitride, wherein the nitrided metal layer is of the form MT_xN_y, where M is a first metal component, T is a Group IIIA or Group IVA transition metal, N is nitrogen, x is an atomic fraction of T, y is an atomic fraction of N, and x and y are each less than one; and

forming a metal layer on the nitrided metal layer, wherein the metal layer comprises the first metal component.

58. The method of claim 57, wherein forming a layer of titanium nitride further comprises forming a layer of titanium nitride covering sidewalls and a bottom of a recess.

59. The method of claim 58, wherein a portion of the layer of titanium nitride covering the bottom of the recess is in contact with a base layer underlying a dielectric layer.

60. The method of claim 59, wherein the base layer is selected from the group consisting of a semiconductor substrate and a conductor layer.

61. The method of claim 57, wherein M is selected from the group consisting of copper, silver, gold, palladium, platinum, rhenium, iridium, ruthenium and osmium.

62. The method of claim 57, wherein T is selected from the group consisting of scandium, yttrium, lanthanum, titanium, zirconium and hafnium.

63. A method of forming a portion of an integrated circuit device, the method comprising:

forming a layer of titanium nitride;

forming a nitrided metal layer on the layer of titanium nitride, wherein the nitrided metal layer is of the form MT_xN_y, where M is a first metal component, T is a Group IIIA or Group IVA transition metal, N is nitrogen, x is an atomic fraction of T, y is an atomic fraction of N, x is less than approximately 0.1 and y is less than approximately 0.9; and

forming a metal layer on the nitrided metal layer, wherein the metal layer comprises the first metal component.

64. The method of claim 63, wherein x is less than approximately 0.05.

65. A method of forming a portion of an integrated circuit device, the method comprising:

forming a layer of titanium nitride;

forming a nitrided metal layer on the layer of titanium nitride, wherein the nitrided metal layer is of the form CuT_xN_y, where Cu is copper, T is a Group IIIA or Group IVA transition metal, N is nitrogen, x is an atomic fraction of T, y is an atomic fraction of N, and x and y are each less than one; and

forming a metal layer on the nitrided metal layer, wherein the metal layer comprises copper.

66. The method of claim 65, wherein T is selected from the group consisting of scandium, yttrium, lanthanum, titanium, zirconium and hafnium.

67. A method of forming a portion of an integrated circuit device, the method comprising:

forming a layer of titanium nitride;

forming a nitrided metal layer on the layer of titanium nitride, wherein the nitrided metal layer is of the form CuT_xN_y, where Cu is copper, T is a Group IIIA or Group IVA transition metal, N is nitrogen, $\boldsymbol{x}$ is an atomic fraction of T, $\boldsymbol{y}$ is an atomic fraction of N, $\boldsymbol{x}$ is less than approximately 0.1 and $\boldsymbol{y}$ is less than approximately 0.9; and

forming a copper layer on the nitrided metal layer.

68. A method of forming a portion of an integrated circuit device, the method comprising:

forming a layer of titanium nitride;

forming a nitrided metal layer on the layer of titanium nitride, wherein the nitrided metal layer comprises copper, a metal component selected from the group consisting of scandium, yttrium, lanthanum, titanium, zirconium and hafnium, and nitrogen, wherein an atomic ratio of copper to the metal component in the nitrided metal layer is greater than ten; and

forming a copper layer on the nitrided metal layer.

69. The method of claim 68, wherein the atomic ratio of copper to the metal component in the nitrided metal layer is greater than twenty.

70. A method of forming a metal interconnect in an integrated circuit device, the method comprising:

forming a dielectric layer on a base layer;

forming a recess in the dielectric layer;

forming a titanium nitride layer on sidewalls of the recess and a surface of the base layer;

forming a nitrided metal layer on the titanium nitride layer, wherein the nitrided metal layer comprises silver, a metal component capable of forming a crystalline compound with the silver, and nitrogen, wherein the metal component is selected from the group consisting of scandium, yttrium and lanthanum, and wherein an atomic ratio of silver to the metal component in the nitrided metal layer is greater than one;

forming a silver layer on the nitrided metal layer, wherein the silver layer fills the recess and overlies a surface of the dielectric layer; and

removing portions of the titanium nitride layer, the nitrided metal layer and the silver layer overlying the surface of the dielectric layer to define the metal interconnect as portions of the titanium nitride layer, the nitrided metal layer and the silver layer remaining in the recess.

71. A method of forming a portion of an integrated circuit device, the method comprising:

forming a layer of titanium nitride;

forming a nitrided metal layer on the layer of titanium nitride, wherein the nitrided metal layer is of the form AgT_xN_y, where Ag is silver, T is a Group IIIA transition metal, N is nitrogen, x is an atomic fraction of T, y is an atomic fraction of N, and x and y are each less than one; and

forming a metal layer on the nitrided metal layer, wherein the metal layer comprises silver.

72. The method of claim 71, wherein T is selected from the group consisting of scandium, yttrium and lanthanum.

73. A method of forming a portion of an integrated circuit device, the method comprising:

forming a layer of titanium nitride;

forming a nitrided metal layer on the layer of titanium nitride, wherein the nitrided metal layer is of the form AgT_xN_y, where is silver, T is a Group IIIA transition metal, N is nitrogen, $\boldsymbol{x}$ is an atomic fraction of T, $\boldsymbol{y}$ is an atomic fraction of N, $\boldsymbol{x}$ is less than approximately 0.1 and $\boldsymbol{y}$ is less than approximately 0.9; and

forming a silver layer on the nitrided metal layer.

74. The method of claim 73, wherein $\boldsymbol{x}$ is less than approximately 0.05.

75. A method of forming a portion of an integrated circuit device, the method comprising:

forming a layer of titanium nitride;

forming a nitrided metal layer on the layer of titanium nitride, wherein the nitrided metal layer comprises silver, a metal component selected from the group consisting of scandium, yttrium and lanthanum, and nitrogen, wherein an atomic ratio of silver to the metal component in the nitrided metal layer is greater than ten; and

forming a silver layer on the nitrided metal layer.

76. The method of claim 75, wherein the atomic ratio of silver to the metal component in the nitrided metal layer is greater than twenty.

77. A method of forming a metal interconnect in an integrated circuit device, the method comprising:

forming a dielectric layer on a base layer;

forming a recess in the dielectric layer;

forming a titanium nitride layer on sidewalls of the recess and a surface of the base layer;

forming a nitrided metal layer on the titanium nitride layer using a physical vapor deposition process in a nitrogen-containing atmosphere and a physical vapor deposition source containing copper and a metal component capable of forming a crystalline compound with copper, wherein the metal component is selected from the group consisting of scandium, yttrium, lanthanum, titanium, zirconium and hafnium, and wherein an atomic ratio of copper to the metal component in the nitrided metal layer is greater than one;

forming a copper layer on the nitrided metal layer, wherein the copper layer fills the recess and overlies a surface of the dielectric layer; and

removing portions of the titanium nitride layer, the nitrided metal layer and the copper layer overlying the surface of the dielectric layer to define the metal interconnect as portions of the titanium nitride layer, the nitrided metal layer and the copper layer remaining in the recess.

78. The method of claim 77, wherein the physical vapor deposition source is a composite source having a first portion containing copper in an elemental state and a second portion containing the crystalline compound of copper and the metal component.

79. The method of claim 78, wherein the crystalline compound is copper-rich.

80. The method of claim 78, wherein the first and second portions of the physical vapor deposition source are intermixed.

81. The method of claim 77, wherein the physical vapor deposition process is a sputtering process.

82. The method of claim 77, wherein the nitrogen-containing atmosphere comprises approximately 5% to 30% by volume of nitrogen in an inert gas.

83. The method of claim 80, wherein the inert gas is argon.

84. A method of forming a metal interconnect in an integrated circuit device, the method comprising:

forming a dielectric layer on a base layer;

forming a recess in the dielectric layer;

forming a titanium nitride layer on sidewalls of the recess and a surface of the base layer;

forming a nitrided metal layer on the titanium nitride layer using a physical vapor deposition process in a nitrogen-containing atmosphere and a physical vapor deposition source containing silver and a metal component capable of forming a crystalline compound with silver, wherein the metal component is selected from the group consisting of scandium, yttrium and lanthanum, and wherein an atomic ratio of silver to the metal component in the nitrided metal layer is greater than one;

forming a silver layer on the nitrided metal layer, wherein the silver layer fills the recess and overlies a surface of the dielectric layer; and

removing portions of the titanium nitride layer, the nitrided metal layer and the silver layer overlying the surface of the dielectric layer to define the metal

interconnect as portions of the titanium nitride layer, the nitrided metal layer and the silver layer remaining in the recess.

85. The method of claim 84, wherein the physical vapor deposition source is a composite source having a first portion containing silver in an elemental state and a second portion containing the crystalline compound of silver and the metal component.

86. The method of claim 85, wherein the crystalline compound is silver-rich.

87. The method of claim 85, wherein the first and second portions of the physical vapor deposition source are intermixed.

88. The method of claim 84, wherein the physical vapor deposition process is a sputtering process.

89. The method of claim 84, wherein the nitrogen-containing atmosphere comprises approximately 5% to 30% by volume of nitrogen in an inert gas.

90. The method of claim 87, wherein the inert gas is argon.

91. An interconnect of an integrated circuit device, comprising:

a diffusion barrier layer;

a first metal layer on the diffusion barrier layer, wherein the first metal layer comprises a first metal component and a second metal component forming a crystalline compound with the first metal component, wherein the second metal component has a surface energy lower than a surface energy of the first metal component, and wherein the crystalline compound is rich in the first metal component; and

a second metal layer on the first metal layer, wherein the second metal layer comprises the first metal component.

92. The interconnect of claim 91, wherein the diffusion barrier layer is a titanium-containing layer.

93. The interconnect of claim 91, wherein the diffusion barrier layer is titanium nitride.

94. The interconnect of claim 91, wherein the first metal component is selected from the group consisting of copper, silver, gold, palladium, platinum, rhenium, iridium, ruthenium and osmium.

95. The interconnect of claim 91, wherein the second metal component is selected from the group consisting of scandium, yttrium, lanthanum, titanium, zirconium and hafnium.

96. The interconnect of claim 91, wherein the first metal layer further comprises a third metal component forming a second crystalline compound with the first metal component, wherein the third metal component is different from the second metal component, wherein the third metal component has a surface energy lower than a surface energy of the first metal component, and wherein the second crystalline compound is rich in the first metal component.

97. A portion of an integrated circuit device, comprising:
a dielectric layer overlying a base layer;
a layer of titanium nitride overlying the dielectric layer;
a first metal layer on the layer of titanium nitride, wherein the first metal layer comprises a crystalline alloy compound containing a first metal component and a second metal component, wherein the second metal component is

selected from the group consisting of Group IIIA and Group IVA elements, and wherein an atomic ratio of the first metal component to the second metal component in the first metal layer is greater than one; and

a second metal layer on the first metal layer, wherein the second metal layer comprises the first metal component.

98. The portion of an integrated circuit device of claim 97, wherein the atomic ratio of the first metal component to the second metal component in the first metal layer is greater than two.

99. The portion of an integrated circuit device of claim 97, wherein the atomic ratio of the first metal component to the second metal component in the first metal layer is greater than ten.

100. The portion of an integrated circuit device of claim 97, wherein the atomic ratio of the first metal component to the second metal component in the first metal layer is greater than twenty.

101. The portion of an integrated circuit device of claim 97, wherein the layer of titanium nitride is adjoining a portion of the dielectric layer.

102. The portion of an integrated circuit device of claim 101, wherein the layer of titanium nitride is further adjoining a portion of the base layer.

103. The portion of an integrated circuit device of claim 97, wherein the base layer is selected from the group consisting of a semiconductor substrate and a conductor layer.

104. An interconnect of an integrated circuit device, comprising:

a titanium nitride layer;

a first metal layer on the titanium nitride layer, wherein the first metal layer comprises copper and a metal component forming a crystalline compound with the copper, wherein the metal component is selected from the group consisting of scandium, yttrium, lanthanum, titanium, zirconium and hafnium, and wherein the crystalline compound has an atomic ratio of copper to the metal component in the first metal layer of greater than one; and

a second metal layer on the first metal layer, wherein the second metal layer comprises copper.

105. A portion of an integrated circuit device, comprising:

a layer of titanium nitride adjoining a dielectric layer;

a metal layer on the layer of titanium nitride, wherein the metal layer comprises a copper-rich alloy selected from the group consisting of Cu_4Sc, Cu_6Y, Cu_4Ti, Cu_3Ti and Cu_5Zr; and

a copper layer on the metal layer.

106. The portion of an integrated circuit device of claim 105, wherein the copper-rich alloy has a crystalline structure.

107. The portion of an integrated circuit device of claim 105, wherein the metal layer further comprises elemental copper.

108. The portion of an integrated circuit device of claim 107, wherein at least 25 wt% of the metal layer is the elemental copper.

109. The portion of an integrated circuit device of claim 107, wherein at least 50 wt% of the metal layer is the elemental copper.

110. The portion of an integrated circuit device of claim 105, wherein the layer of titanium nitride is further adjoining a base layer selected from the group consisting of a semiconductor substrate and a conductor layer.

111. An interconnect of an integrated circuit device, comprising:
a layer of titanium nitride;
a first metal layer on the layer of titanium nitride, wherein the first metal layer comprises elemental copper, wherein the first metal layer further comprises a copper-rich crystalline alloy compound containing copper and a metal component selected from the group consisting of scandium, yttrium, lanthanum, titanium, zirconium and hafnium, and wherein at least 25 wt% of the first metal layer is elemental copper; and
a second metal layer on the first metal layer, wherein the second metal layer comprises copper.

112. An interconnect of an integrated circuit device, comprising:
a layer of titanium nitride;
a first metal layer on the layer of titanium nitride, wherein the first metal layer comprises elemental copper, wherein the first metal layer further comprises a copper-rich crystalline alloy compound containing copper and a metal component selected from the group consisting of scandium, yttrium, lanthanum, titanium, zirconium and hafnium, and wherein an atomic ratio of copper to the metal component in the first metal layer is greater than ten; and
a second metal layer on the first metal layer, wherein the second metal layer comprises copper.

113. An interconnect of an integrated circuit device, comprising:
a titanium nitride layer;

a first metal layer on the titanium nitride layer, wherein the first metal layer comprises silver and a metal component forming a crystalline compound with the silver, wherein the metal component is selected from the group consisting of scandium, yttrium and lanthanum, and wherein the crystalline compound has an atomic ratio of silver to the metal component in the first metal layer of greater than one; and

a second metal layer on the first metal layer, wherein the second metal layer comprises silver.

114. A portion of an integrated circuit device, comprising:

a layer of titanium nitride adjoining a dielectric layer;

a metal layer on the layer of titanium nitride, wherein the metal layer comprises a silver-rich alloy selected from the group consisting of Ag_4Sc and Ag_4Y; and

a silver layer on the metal layer.

115. The portion of an integrated circuit device of claim 114, wherein the silver-rich alloy has a crystalline structure.

116. The portion of an integrated circuit device of claim 114, wherein the metal layer further comprises elemental silver.

117. The portion of an integrated circuit device of claim 116, wherein at least 25 wt% of the metal layer is the elemental silver.

118. The portion of an integrated circuit device of claim 116, wherein at least 50 wt% of the metal layer is the elemental silver.

119. The portion of an integrated circuit device of claim 114, wherein the layer of titanium nitride is further adjoining a base layer selected from the group consisting of a semiconductor substrate and a conductor layer.

120. An interconnect of an integrated circuit device, comprising:

a layer of titanium nitride;

a first metal layer on the layer of titanium nitride, wherein the first metal layer comprises elemental silver, wherein the first metal layer further comprises a silver-rich crystalline alloy compound containing silver and a metal component selected from the group consisting of scandium, yttrium and lanthanum, and wherein at least 25 wt% of the first metal layer is elemental silver; and

a second metal layer on the first metal layer, wherein the second metal layer comprises silver.

121. An interconnect of an integrated circuit device, comprising:

a layer of titanium nitride;

a first metal layer on the layer of titanium nitride, wherein the first metal layer comprises elemental silver, wherein the first metal layer further comprises a silver-rich crystalline alloy compound containing silver and a metal component selected from the group consisting of scandium, yttrium and lanthanum, and wherein an atomic ratio of silver to the metal component in the first metal layer is greater than ten; and

a second metal layer on the first metal layer, wherein the second metal layer comprises silver.

122. An interconnect of an integrated circuit device, comprising:

a diffusion barrier layer;

a nitrided metal layer on the diffusion barrier layer, wherein the nitrided metal layer comprises a first metal component, a second metal component capable of forming a crystalline compound with the first metal component, and nitrogen, wherein the second metal component has a surface energy lower than a surface energy of the first metal component, and wherein the nitrided metal layer is rich in the first metal component; and

a second metal layer on the nitrided metal layer, wherein the second metal layer comprises the first metal component.

123. The interconnect of claim 122, wherein the diffusion barrier layer is a titanium-containing layer.

124. The interconnect of claim 122, wherein the diffusion barrier layer is titanium nitride.

125. The interconnect of claim 122, wherein the first metal component is selected from the group consisting of copper, silver, gold, palladium, platinum, rhenium, iridium, ruthenium and osmium.

126. The interconnect of claim 122, wherein the second metal component is selected from the group consisting of scandium, yttrium, lanthanum, titanium, zirconium and hafnium.

127. An interconnect of an integrated circuit device, comprising:

a layer of titanium nitride;

a nitrided metal layer on the layer of titanium nitride, wherein the nitrided metal layer comprises a nitride metal alloy compound containing a first metal component, a second metal component and nitrogen, wherein the second

metal component is selected from the group consisting of Group IIIA and Group IVA elements, and wherein an atomic ratio of the first metal component to the second metal component in the nitrided metal layer is greater than one; and

a metal layer on the nitrided metal layer, wherein the metal layer comprises the first metal component.

128. The interconnect of claim 127, wherein the atomic ratio of the first metal component to the second metal component in the first metal layer is greater than two.

129. The interconnect of claim 127, wherein the atomic ratio of the first metal component to the second metal component in the first metal layer is greater than ten.

130. The interconnect of claim 127, wherein the atomic ratio of the first metal component to the second metal component in the first metal layer is greater than twenty.

131. A portion of an integrated circuit device, comprising:

a dielectric layer on a base layer;

a titanium nitride layer overlying the dielectric layer;

a nitrided metal layer on the titanium nitride layer, wherein the nitrided metal layer comprises copper, a metal component capable of forming a crystalline compound with the copper, and nitrogen, wherein the metal component is selected from the group consisting of scandium, yttrium, lanthanum, titanium, zirconium and hafnium, and wherein an atomic ratio of copper to the metal component in the nitrided metal layer is greater than one; and

a copper layer on the nitrided metal layer.

132. The portion of an integrated circuit device of claim 131, wherein a portion of the titanium nitride layer is adjoining a portion of the base layer.

133. A portion of an integrated circuit device, comprising:

a layer of titanium nitride;

a nitrided metal layer on the layer of titanium nitride, wherein the nitrided metal layer is of the form MT_xN_y, where M is a first metal component, T is a Group IIIA or Group IVA transition metal, N is nitrogen, x is an atomic fraction of T, y is an atomic fraction of N, and x and y are each less than one; and

a metal layer on the nitrided metal layer, wherein the metal layer comprises the first metal component.

134. The portion of an integrated circuit device of claim 133, wherein M is selected from the group consisting of copper, silver, gold, palladium, platinum, rhenium, iridium, ruthenium and osmium.

135. The portion of an integrated circuit device of claim 133, wherein T is selected from the group consisting of scandium, yttrium, lanthanum, titanium, zirconium and hafnium.

136. A portion of an integrated circuit device, comprising:

a layer of titanium nitride;

a nitrided metal layer on the layer of titanium nitride, wherein the nitrided metal layer is of the form MT_xN_y, where M is a first metal component, T is a Group IIIA or Group IVA transition metal, N is nitrogen, x is an atomic fraction of T, y is an atomic fraction of N, x is less than approximately 0.1 and y is less than approximately 0.9; and

a metal layer on the nitrided metal layer, wherein the metal layer comprises the first metal component.

137. A portion of an integrated circuit device, comprising:

a layer of titanium nitride;

a nitrided metal layer on the layer of titanium nitride, wherein the nitrided metal layer is of the form CuT_xN_y, where Cu is copper, T is a Group IIIA or Group IVA transition metal, N is nitrogen, x is an atomic fraction of T, y is an atomic fraction of N, and x and y are each less than one; and

a metal layer on the nitrided metal layer, wherein the metal layer comprises copper.

138. The portion of an integrated circuit device of claim 137, wherein T is selected from the group consisting of scandium, yttrium, lanthanum, titanium, zirconium and hafnium.

139. A portion of an integrated circuit device, comprising:

a dielectric layer on a base layer;

a titanium nitride layer overlying the dielectric layer;

a nitrided metal layer on the titanium nitride layer, wherein the nitrided metal layer comprises silver, a metal component capable of forming a crystalline compound with the silver, and nitrogen, wherein the metal component is selected from the group consisting of scandium, yttrium and lanthanum, and wherein an atomic ratio of silver to the metal component in the nitrided metal layer is greater than one; and

a silver layer on the nitrided metal layer.

140. The portion of an integrated circuit device of claim 139, wherein a portion of the titanium nitride layer is adjoining a portion of the base layer.

141. A portion of an integrated circuit device, comprising:

a titanium nitride layer;

a nitrided metal layer on the titanium nitride layer, wherein the nitrided metal layer comprises silver, a metal component capable of forming a crystalline compound with the silver, and nitrogen, wherein the metal component is selected from the group consisting of scandium, yttrium and lanthanum, and wherein an atomic ratio of silver to the metal component in the nitrided metal layer is greater than one; and

a silver layer on the nitrided metal layer.

142. A portion of an integrated circuit device, comprising:

a layer of titanium nitride;

a nitrided metal layer on the layer of titanium nitride, wherein the nitrided metal layer is of the form AgT_xN_y, where Ag is silver, T is a Group IIIA transition metal, N is nitrogen, x is an atomic fraction of T, y is an atomic fraction of N, and x and y are each less than one; and

a metal layer on the nitrided metal layer, wherein the metal layer comprises silver.

143. The portion of an integrated circuit device of claim 142, wherein T is selected from the group consisting of scandium, yttrium and lanthanum.

144. A portion of an integrated circuit device, comprising:

a layer of titanium nitride;

a nitrided metal layer on the layer of titanium nitride, wherein the nitrided metal layer is of the form AgT_xN_y, where is silver, T is a Group IIIA transition

metal, N is nitrogen, x is an atomic fraction of T, y is an atomic fraction of N, x is less than approximately 0.1 and y is less than approximately 0.9; and

a silver layer on the nitrided metal layer.